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ABSTRACT

The Internet contains a vast array of educational resources, ranging from individual activities to whole curricula. This research study used content analyses and an electronic questionnaire to investigate how and why PreK-12 educators use information from the Internet for instructional design purposes in order to inform the design of an Internet-based system that provides one-stop, any-stop access to Internet-based educational materials. Results indicate that lesson plans are the most sought-after instructional resource on the Internet. The data also revealed that, although most respondents use the Internet for instructional planning, they often consult several resources (print, electronic, and/or human) and use or adapt the information to meet their specific instructional needs. Tables and figures present data related to: elements found in instructional resources; requested information in AskERIC questions; specified information in AskERIC questions; content areas represented by questionnaire respondents; sources of information used for instructional planning; top-rated preferred information sources for instructional planning by subject area; amount of Internet use for instructional planning by subject area; critical elements of Internet-based lesson plans; ease of Internet search; amount of relevant information found; and level of satisfaction with Internet search.

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An Investigation of PreK-12 Educators' Information Needs and Search Behaviors on the Internet

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Abstract

The Internet contains a vast array of educational resources, ranging from individual activities to whole curricula. This research study used content analyses and an electronic questionnaire to investigate how and why PreK-12 educators use information from the Internet for instructional design purposes in order to inform the design of an Internet-based system that provides one-stop, any-stop access to Internet-based educational materials. Results indicate that lesson plans are the most sought-after instructional resource on the Internet. The data also revealed that although most respondents use the Internet for instructional planning, they often consult several resources (print, electronic, and/or human) and use or adapt the information to meet their specific instructional needs.

Introduction

The number of educational resources available via the Internet-World Wide Web---valuable collections containing text, images and sounds, existing solely in electronic form---is increasing exponentially every day (Weibel, 1995). The organization of these materials is defined by the indexes provided by each of the various electronic locator services (e.g. Yahoo, Alta Vista) and independent online information providers [e.g. Educational Resource Information Clearinghouse (ERIC), Eisenhower National Clearinghouse, NASA]. But when the scope of resources becomes extensive, requiring richer records for each resource in order to improve search and retrieval, the usefulness of these Internet-based indexes becomes limited (Weibel, 1995).

If we think of each of these electronic collections as "virtual libraries," a teacher could currently visit any one library and retrieve some materials but then would have to go to another library and use different search strategies to find other materials and yet another for more or different materials. However, unlike today's physical library systems, these Internet-based virtual libraries have no overall organizing structure for information location and access. Extending our library metaphor, there is no "union catalog" (i.e. catalog of catalogs) on the Internet that allows users to go to one library and automatically access all related educational materials housed in other library collections. On the contrary, the Internet user must enter each virtual library (assuming an awareness of all relevant electronic collections and their locations), search for desired information, sift through the located resources to determine which are most relevant and useful, and then enter another virtual library, search and gather information again, enter another and search again, and so on. One potential result is information overload; for example, one participant in this study reported finding more than 30,000 lesson plans through Yahoo alone. This process is not only cumbersome and time-consuming, but also discouraging to the user, frequently causing him or her to prematurely end the search process without knowing if the most relevant and useful information has been located.

The Gateway to Educational Materials (GEM) Project, which teams a range of public and private information providers, national educational organizations, regional education laboratories, and state education departments, was funded through the ERIC Clearinghouse on Information and Technology by the U.S. Department of Education to develop a system for educators that provides "one-stop, any stop access" to the broad range of educational materials (e.g. teacher guides, lesson plans, curricula, primary documents) on the World Wide Web. GEM users can enter any of the educational databases within the GEM system (e.g. the AskERIC Virtual Library, Eisenhower National Clearinghouse, NSF's Math Forum), specify the parameters of their information need (e.g. "a reading curriculum for upper elementary gifted students," "tenth grade history lesson plans on the American colonial

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period"), receive a rich set of records describing all and only those resources that meet the specified criteria, and obtain quick and direct access to those resources.

Each resource in the GEM system is described by a simple, standardized metadata record, a set of descriptive terms that are "more informative than an index entry but less complete than a formal cataloging record" (Weibel, 1995, p.1), which automated tools are able to recognize and collect (Weibel, 1995). In order to define a metadata profile of search terms that simply yet sufficiently represents all of the electronic educational resources contained within GEM's "union catalog," research was conducted to explore how and what instructional resources are currently represented on the Internet, what types of information educators seek when designing their instruction, and how educators search for information electronically.

The specific research questions explored were:

- (1) What are the most common types of instructional resources on the Internet and what are their essential elements?
- (2) What information sources (including the Internet) do educators consult for instructional planning?
- (3) When using the Internet for instructional planning, for what types of instructional information do educators search?
- (4) How do educators rate their Internet searches in terms of ease, success, and satisfaction with the search process?

Methods

A variety of research methods was utilized to answer the above research questions. These methods were used to explore teachers' information-seeking behaviors when performing electronic information searches on the Internet and to identify the essential elements of instructional resources on the Internet. The methods include:

- a content analysis of Internet-based instructional resources to determine their most common elements. As part of a course assignment, twenty-one graduate students at a northeastern university were asked to locate and retrieve a minimum of five instructional resources from the Internet-World Wide Web for analysis.
- a content analysis of questions submitted to AskERIC, the Internet-based educational question-and-answer service of the ERIC Clearinghouse on Information & Technology, to explore the specific instruction-related information-seeking needs of educators using the Internet and the terms they use to describe those needs. An analysis of 1,995 questions submitted to the AskERIC service during July 1996 was performed to determine how and with what terms educators ask for information for instructional planning. The advantages of this method are that it (1) is an unobtrusive and naturalistic way to study user behavior and (2) limits bias due to reconstruction, post-hoc rationalization, or expectancy effect.
- an electronic questionnaire, based on the data gathered from the content analyses, to determine how educators search for instructional information on the Internet and administered online through the AskERIC service. AskERIC users were selected because they were more likely to be (1) regular users of technology and (2) members of the targeted preK-12 educator audience. Although this data gathering technique was easy to administer and able to reach large numbers of potential respondents, there were disadvantages; e.g., due to the length of the questionnaire, many of the questions were necessarily brief; there was no way to elicit follow-up, clarifying information.

Results

- (1) What are the most common types of instructional resources on the Internet and what are their essential elements?

Educational resources range in scope from the broadest curricula to the narrowest activities. Most instructional resources appear to fall under one of the following categories (Eby and Kujawa, 1994):

- curriculum guides or courses of study that may span several grade levels and subject areas (e.g. science, U.S. History). These may contain a number of:
 - units, thematic divisions within a semester or year-long curriculum (e.g. constellations, American Civil War). These may contain two or more:

- lesson plans, one- or two-session, organized learning experiences (e.g. the Big Dipper, the Battle of Bull Run). The narrowest type of educational resource may appear as part of a lesson plan or stand alone as an autonomous entity. These include:
 - learning resources (e.g. a reference book on constellations, a multimedia CD-ROM on the Civil War)
 - learning activities (e.g. making a mobile of a constellation, a field trip to a Civil War battleground)

From the original sample of 111 Web-based Internet resources, 13 were found to be duplicates and three were not considered instructional, leaving 95 resources for analysis. Of the 95 resources, there were 72 lesson plans (76%), 22 unit plans (23%), and one activity (1%). Although this sample was relatively small in comparison to the thousands of resources available on the Internet, it appears to be representative, indicating that lesson plans are among the most common type of instructional resource available on the Internet.

A content analysis of the 95 Web-based resources revealed 32 categories of common elements. The elements appeared either as separate and distinct elements or as elements embedded within other elements. Separate elements appearing in 90% or more of the resources were activities (95; 100%), materials (e.g. handout, textbook, video) (91; 96%), title (88; 93%), and purpose (e.g. instructional goals, learning objectives) (87; 92%). Elements embedded within other elements 90% or more of the time were instructional strategies (e.g. examples) (95; 100%), and topic (85; 90%) (see Table 1). Elements appearing in at least one-half of the resources were grade, subject area, and author (separate) and grouping (embedded). Most embedded elements were found within either title or activities.

In order to further explore the types of information important to educators, 1,995 questions submitted to AskERIC during July 1996 were retrieved and analyzed for relevance, resulting in a total of 161 relevant [related to pre-Kindergarten (preK) through Grade 12 instructional design] questions for content analysis. PreK was included because of the common integration of preK classes into elementary schools throughout the U.S. (Riede, 1997). Data were analyzed by two independent coders with a .93 coefficient of reliability, deemed acceptable.

Each question was analyzed to determine what information was requested and what information was specified within it. Data analysis determined that, by far, the most frequently requested type of instructional information was the lesson (54; 33%) (see Figure 1). All other requested information (e.g. materials, activities, units) was included in less than 10% of all questions.

Element	Occurrence N(%)	Separate n (%)	Embedded n (%) (Most Common Location)
activities	95 (100%)	95 (100%)	0 (0%)
instruc. strategies	95 (100%)	0 (0%)	95 (100%) activities
materials	91 (96%)	70 (77%)	21 (23%) activities
title	88 (93%)	88 (100%)	0 (0%)
purpose	88 (93%)	85 (98%)	2 (2%) title/summary
topic	85 (90%)	16 (19%)	69 (81%) title
grade	75 (79%)	61 (81%)	14 (19%) title
subject area	64 (67%)	47 (74%)	17 (26%) title
grouping	56 (59%)	8 (14%)	48 (86%) activities
author	56 (59%)	56 (100%)	0 (0%)
date	43 (45%)	26 (61%)	17 (39%) copyright statement
content descrip.	42 (44%)	19 (45%)	23 (55%) activities
author address	38 (40%)	38 (100%)	0 (0%)
assessment	37 (39%)	28 (76%)	9 (24%) forms
time	32 (34%)	20 (63%)	12 (37%) activities
enrichment	32 (34%)	30 (94%)	2 (6%) activities
publisher	30 (32%)	15 (50%)	15 (50%) copyright
add. resources	27 (28%)	25 (93%)	2 (6%) activities
materials proced.	19 (20%)	6 (32%)	13 (68%) activities/materials
copyright	15 (16%)	15 (100%)	0 (0%)
source	13 (14%)	13 (100%)	0 (0%)
forms	19 (10%)	19 (100%)	0 (0%)
prerequisites	9 (10%)	9 (100%)	0 (0%)
summary	8 (8%)	8 (100%)	0 (0%)
other audiences	7 (7%)	7 (100%)	0 (0%)
outline	7 (7%)	7 (100%)	0 (0%)
location	7 (7%)	1 (14%)	6 (86%) activities
instruc. style	5 (5%)	4 (80%)	1 (20%) outline
teacher role	4 (4%)	4 (100%)	0 (0%)
comments	3 (3%)	3 (100%)	0 (0%)
season/weather	2 (2%)	0 (0%)	0 (100%) activities
author descrip.	2 (2%)	2 (100%)	0 (0%)

Table 1. Total Occurrence, Separate and Embedded (with Common Location) Elements Found in Instructional Resources (N=95).

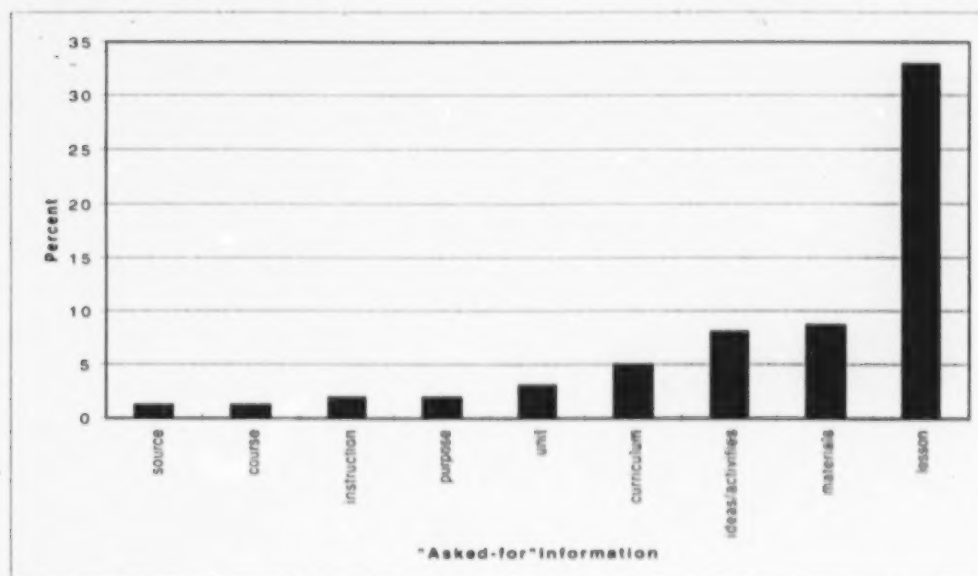


Figure 1. Requested Information in AskERIC Questions (N=161).

Data revealed that educators typically frame their queries in the context of a subject area, i.e. either a broad curriculum domain such as mathematics or science or a more specific subject such as algebra or ecology (74; 46%), grade range (e.g. middle school, primary) (69; 43%), and/or topic, i.e. more specific subject such as primary numbers or air pollution (57; 35%) (see Figure 2). A specified grade level was included within 39 (24%) of the AskERIC questions. All other specified elements were present in less than 20% of all queries.

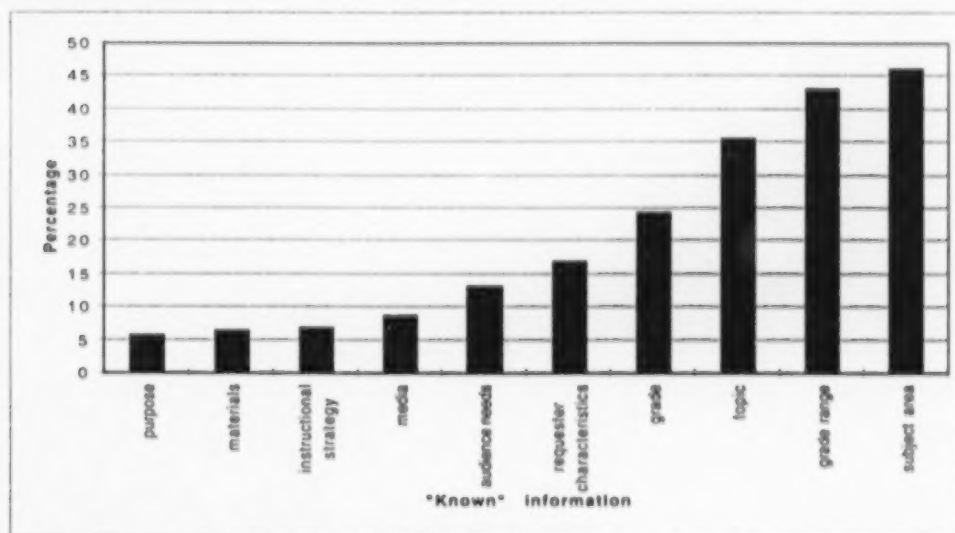


Figure 2. Specified Information in AskERIC Questions (N=161).

- (2) What information sources (including the Internet) do educators consult for instructional planning?

A 32-item questionnaire consisting of 21 multiple-choice and Likert-type items and 11 open-ended questions was emailed to 2,135 questioners who had used the AskERIC service during July and August 1996. A total of 283

responses (13%) were returned; 23 were classified as invalid because the respondent was not directly involved with preK-12 instruction, leaving 260 questionnaires for analysis. The low response rate was attributed to three potential causes: (1) the high number of "other" users of AskERIC (e.g. adult educators, school administrators, students) who were not the targeted respondents for this study, (2) some AskERIC users may have submitted more than one question to AskERIC during that time period and, therefore, would have received multiple questionnaires but only returned one, and (3) the difficulty for some participants to respond electronically due to inadequate hardware or limited access. Results where $N < 260$ indicate missing responses.

Demographically, respondents ($N=257$) represent all types of community school districts: urban (72; 28%), suburban (92; 36%), and rural (81; 31%), with 12 (5%) indicating they came from some combination (e.g. rural-suburban). In terms of years of instructional experience, more than one-half (145; 57%) of respondents ($N=256$) had more than 10 years of teaching experience, 56 (22%) had 6-10 years, 39 (15%) had been teaching from one and five years, and 16 (6%) had less than one year of teaching experience. The majority ($N=244$) were female (189; 77%), with 55 (24%) male. These statistics roughly parallel national demographic patterns of U.S. educators (NCES, 1996; 1997).

Respondents also represent the range of content areas of preK-12 instruction. Of the 249 respondents, 22 (9%) were from the math/science subjects; 31 (12%) were from the humanities (language arts, English, foreign languages, religion and philosophy, art); 16 (6%) represented the social sciences (economics, history, geography, civics, social studies); 72 (29%) taught all subjects (e.g. elementary, special education); 34 (14%) taught multiple subjects (i.e. two or more subjects, but not all subjects); and 74 (30%) were information technology educators (library media specialists, computer teachers) (see Figure 3). The over-representation of the latter category [e.g. library media specialists represent 2% of U.S. educators (NCES, 1996)] is most likely due to the bias of drawing the sample from the AskERIC user population which typically includes a large proportion of library media specialists and technology teachers.

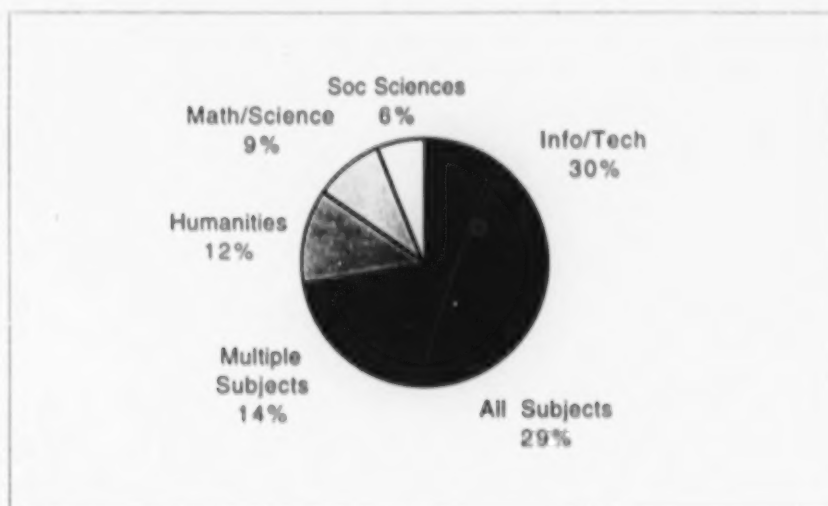


Figure 3. Content Areas Represented by Questionnaire Respondents ($N=249$).

Although an attempt was made to classify respondents by grade level categories (e.g. K-5, 9-12), it soon became apparent that it was not possible to create exclusive grade level clusters because of the wide variety of responses to this question. Some responses that illustrate this variety are: "K-12," "grades 5-8," "10-14 year olds," "grades 3, 5 and 8," "preK-K," "grades 6-12," and "grade 1."

Respondents were asked to rate thirteen information resources that typically contain information used for instructional design on a scale of 1 (never used) to 5 (used very often). In general, the most commonly used resources appear to be print-based (journals & newsletters, K-12 textbooks, books/magazines), followed by workshops and electronic resources (Internet sites, databases). (see Table 2). When it comes to human sources, colleagues is the only resource ranked above 3.0.

Source	Ranking
journals/newsletters	3.81
K-12 textbooks	3.76
books/magazines	3.74
workshops	3.64
Internet sites	3.51
electronic databases	3.46
colleagues	3.03
librarians	2.97
experts	2.91
videos	2.70
bulletin boards/listservs	2.70
college textbooks	2.68
radio/tv	2.64

Table 2. Sources of Information Used for Instructional Planning (1=never used; 5=used very often) (N=260).

Respondents also indicated that they use a variety of sources when looking for information to design their lessons, preferring the "berrypicking method" as described by Bates (1989); i.e. consulting several sources, selecting "nuggets" of information from each source as their search strategies, questions, goals, and relevance criteria evolve. Furthermore, although educators describe lesson plans and other instructional resources they find as valuable, they rarely use them "as is," but rather either adapt them to their specific situation, use them as idea generators for their own plans, or use part(s) of them.

There are some interesting differences among groups of subject area educators in their preferred information sources. Looking at the top five ranked sources of information by subject area, journals/newsletters and K-12 textbooks are consistently rated first and/or second most important across subject areas (see Table 3). However, all subjects educators ranked colleagues highest, indicating a higher degree of dependence on other educators for instructional planning information.

<u>Math/Science (n=22)</u>	<u>Language/Arts (n=31)</u>	<u>Social Studies (n=16)</u>
K-12 textbooks (4.14)	Journals/newsletters (3.67)	Journals/Newsletters (4.29)
Workshops (3.64)	K-12 textbooks (3.67)	K-12 textbooks (4.21)
Colleagues (3.55)	Books/magazines (3.67)	Books/magazines (4.14)
Journals/magazines (3.45)	Colleagues (3.47)	Internet sites (3.77)
Books/magazines (3.41)	Internet sites (3.43)	Colleagues (3.50)
<u>Information/Tech. (n=74)</u>	<u>All Subjects (n=72)</u>	<u>Multiple Subjects (n=34)</u>
Journals/magazines (3.93)	Colleagues (3.93)	K-12 textbooks (3.97)
Electronic databases (3.92)	K-12 textbooks (3.79)	Journals/magazines (3.77)
Internet sites (3.91)	Journals/magazines (3.73)	Books/magazines (3.69)
Books/magazines (3.91)	Workshops (3.65)	Colleagues (3.63)
Workshops (3.85)	Books/magazines (3.62)	Internet sites (3.30)

Table 3. Top Five Rated Preferred Information Sources for Instructional Planning by Subject Area (N=249).

Information/technology educators ranked electronic resources (electronic databases, Internet sites) higher than all other groups, probably because this group is more likely to use electronic resources on a daily basis. Social science educators also ranked print resources (K-12 textbooks, journals & newsletters, other books) higher than all other groups likely due, in part, to the importance of original, print-based historical documents. Internet sites were ranked highly by humanities, social science, information/technology, and multiple subjects educators but not by math/science or all subjects educators. Although librarians as a human resource were ranked below 3.0 overall, they were rated above 3.0 by all subjects educators (3.02) and, as would be expected, by information/technology

educators (3.52). Radio/tv was rated lowest overall except by social science educators, possibly due to the usefulness of these media for obtaining current news and historical events.

Two hundred-ten respondents (81%) indicated they have Internet access at home, while 193 (74%) have access at school, surpassing the national average (65%) for having access at home or at school (NCES, 1997). One hundred-fourteen respondents (44%) reported having access both at home and at school. High access rates for respondents in this study are, again, likely attributable to the biased sample (AsKERIC users) and the Internet access requirement for participation in this study. Interestingly, 43 (17%) of those who stated they have access the Internet at school indicated they never use the Internet at school.

When asked specifically about their use of the Internet as a resource for instructional planning, most respondents (221; 85%) indicated that they use the Internet often (98; 40%) or sometimes (113; 45%) with only 39 (15%) saying they never use the Internet for designing instruction. A closer look at these data by subject area revealed that social science educators are the most frequent users of the Internet, followed by information/technology educators and math/science educators (see Figure 4).

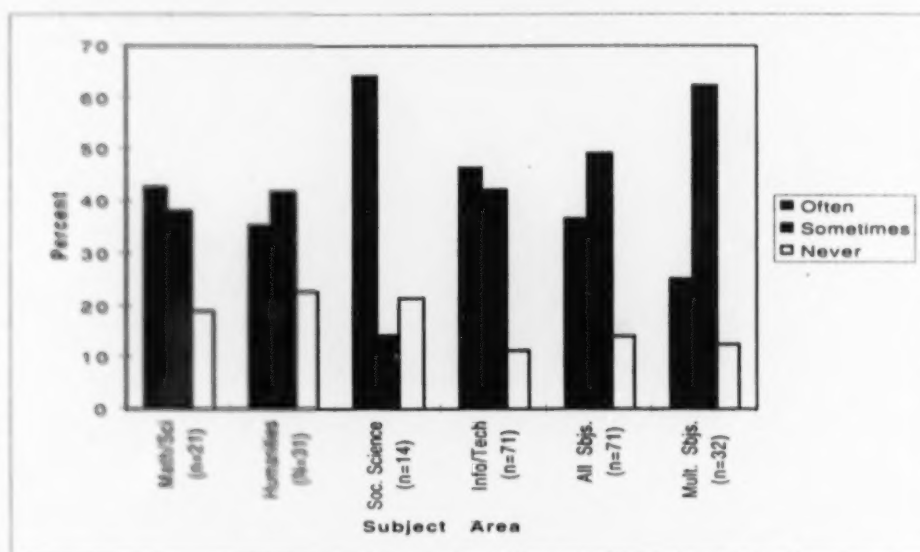


Figure 4. Amount of Internet Use for Instructional Planning by Subject Area (N=240).

(3) When using the Internet for instructional planning, for what types of instructional information do educators search?

Respondents were asked to rate 28 information elements on their importance for lesson planning. These elements included the eight common terms from both content analyses (purpose, grade, subject, topic, materials, grouping, location, and assessment), as well as terms derived from merging similar terms (e.g. instructional style and instructional strategies) and adding one new term (standards) because of the recent development of and emphasis on state and national curriculum standards. Participants were asked to rate each term was rated on a scale of 1=not important to 5= very important. Results show that ten elements were rated 4.0 or higher, including topic, subject, content description, materials (resources necessary for instruction), forms (e.g. handouts, worksheets), grade level(s), purpose (rationale, goals, objectives), outline of lesson, summary and assessment (evaluation of student learning) (see Table 4). Some elements that "add value" to educators' information searches were also rated above 3.0 (e.g. links to state and national standards, comments from colleagues who have used the resource). Of the 28 terms, only author description and publisher were rated below 3.0.

Element	N	Mean	Std Dev
Topic	201	4.39	0.62
Subject	202	4.36	0.71
Content description	198	4.25	0.73
Materials	200	4.24	0.77
Forms	202	4.19	0.81
Grade	203	4.16	0.86
Purpose	202	4.14	0.82
Outline	203	4.06	0.83
Summary	201	4.03	0.82
Assessment	202	4.03	0.88
Materials procedure	199	3.94	0.93
Additional resources	202	3.92	0.82
Prerequisite	199	3.85	0.56
Audience	198	3.78	0.96
Enrichment	201	3.74	0.94
Instructional style	200	3.72	0.9
Time frame	198	3.71	0.93
Scope	197	3.62	1.05
Title	201	3.45	1.07
Standards	201	3.43	1.03
Grouping	198	3.42	1
Comments	202	3.26	1.04
Location	197	3.24	1.07
Date	194	3.19	1.23
Author affiliation	199	3.14	1.12
Copyright	197	3.03	1.19
Author description	198	2.84	1.07
Publisher	198	2.8	1.04

Table 4. Critical Elements of Internet-Based Lesson Plans.

The questionnaire used a critical incident technique, asking respondents to recall a recent experience in which they used the Internet/World Wide Web to find information to use for instructional design purposes. Some examples of the types of experiences described are:

- a middle school teacher wanting to know how to integrate technology into an interdisciplinary language arts/social studies unit on slavery/emancipation for grades 6-8.
- a high school French teacher looking for information on how to create a keypal project.
- a teacher of educable mentally handicapped high school teacher seeking a picture of the human heart "to use with the class as a visual and to assist in the discussion of the human heart."
- a computer teacher looking for computer-based lessons for grades preK-6 on a variety of topics in order to develop an elementary technology curriculum.
- a grade 1-2 teacher looking for "sensory, hands-on activities that included measuring and information on whales" for a science lesson.

- a high school English teacher searching for instructional methods and materials for teaching Shakespeare's Macbeth.
- a science teacher needing information on ways to teach students in grades 3 through 8 how to make holograms.
- an 8th grade civics teacher seeking information about "the positions of candidates on the issues in terms 8th graders could understand."

Participants were asked to specify which Internet resources they found most helpful in their search. Again due to the biased sample, 38 (43%) of total respondents (N=99) cited ERIC or AskERIC. Other specific sites mentioned by more than one respondent were NASA Spacelink; An Aeronautics and Space Resource for Educators (<http://spacelink.msfc.nasa.gov/>) (7), Texas Education Network(TENET) (<http://www.tenet.edu/>)(4), Carol Hurst's Children's Literature Newsletters (<http://www.carolhurst.com/newsletters/newsletters.html>) (2), Kathy Schrock's Guide for Educators (<http://www.capecod.net/schrockguide/>) (2), Children's Literature: A Newsletter for Adults (<http://www.parentsplace.com/readroom/childnew/index.html>) (2), and U.S. Department of Agriculture (USDA) (<http://www.usda.gov>) (2).

(4) How do educators rate their Internet searches in terms of ease, success, and satisfaction with the search process?

A series of subsequent questions asked respondents to rate their recent search in terms of the ease of the search process, the amount of relevant information located, and their satisfaction with the information found. Of those responding (N=204), slightly more participants indicated that their information searches were somewhat easy or very easy (79; 39%) than those who rated them as somewhat difficult or very difficult (62; 30%), while 63 (31%) rated their searches as neither easy nor difficult. (see Figure 5).

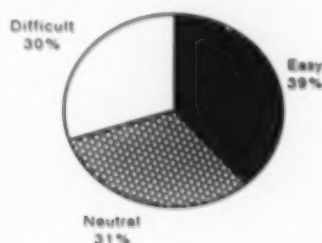


Figure 5. Ease of Internet Search (N=204).

A closer look by subject area found that a majority of math/science (59%) and social science (58%) educators described their searching experiences as easy (see Figure 6). Humanities educators were the only group who rated their searches as difficult more often than neutral or easy.

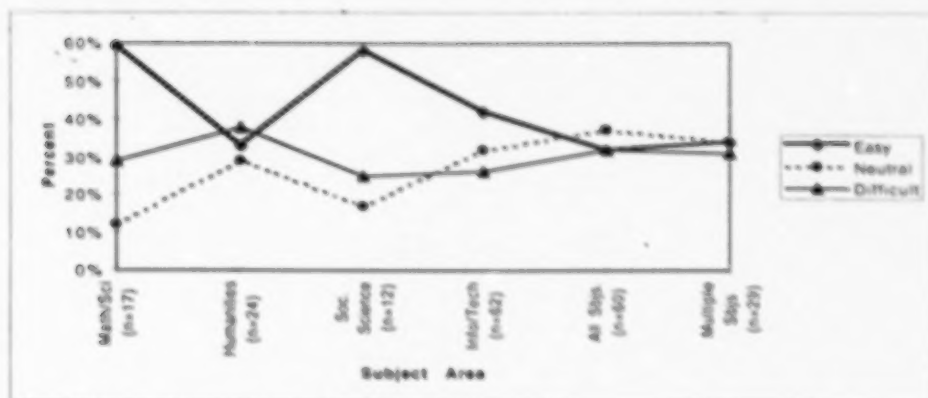


Figure 6. Ease of Internet Search by Subject Area (N=204).

When asked how much relevant information was found, the vast majority (178; 69%) of those responding (N=260) reported finding at least some of the information needed [61(23%) indicated finding most], while only 21 (8%) indicated they found no relevant information (see Figure 7).

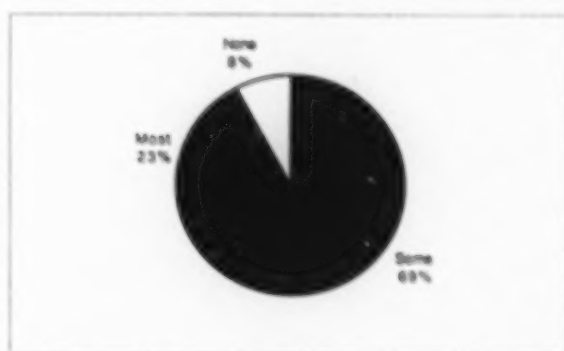


Figure 7. Amount of Relevant Information Found (N=260).

Looking at amount of relevant information retrieved by subject area, social science educators were the most successful with their searches, while all subject educators appear to be least successful (see Figure 8).

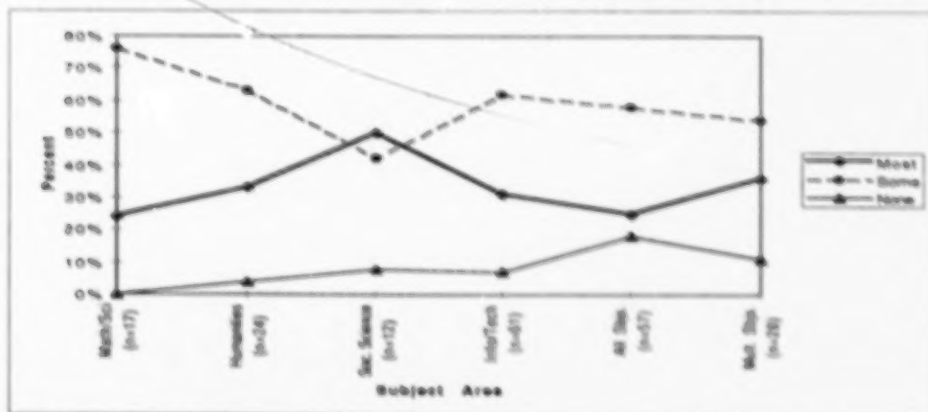


Figure 8. Amount of Relevant Information Found by Subject Area (N=199).

Finally, most respondents ($N=203$) rated their level of satisfaction as somewhat satisfied (82; 40%) or very satisfied (72; 36%) with search results, while 18 (9%) were somewhat dissatisfied and 8 (4%) were very dissatisfied. Twenty-three participants (11%) indicated a neutral response (neither satisfied nor dissatisfied) (see Figure 9).

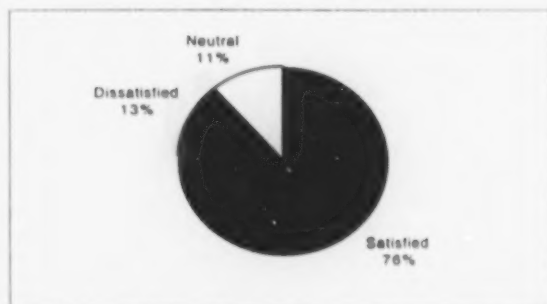


Figure 9. Level of Satisfaction with Internet Search ($N=203$).

Regardless of ease of search or amount of success, most educators from every content area indicated they were satisfied with their searches (see Figure 10).

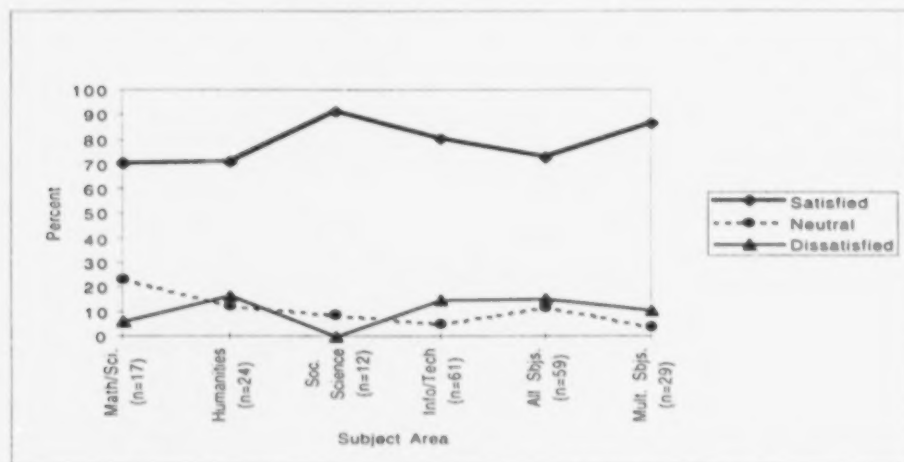


Figure 10. Level of Satisfaction with Internet Search by Subject Area ($N=202$).

Conclusions

This study used content analyses and an electronic questionnaire to investigate how and why PreK-12 educators use information from the Internet for instructional design purposes. Results indicate that lesson plans are the most sought instructional resource on the Internet. The data also revealed that although most respondents use the Internet for instructional planning, they often consult several resources (print, electronic, human) and use or adapt the information they find to meet their specific instructional needs.

Results of this study have been used to inform the design of the GEM system by identifying the most important instructional elements in educational resources (e.g. topic, grade, forms, assessment), as well as elements that "add value" to their information searches (e.g. standards, comments). These elements have formed the metadata profile that describes all resources included in the GEM system. Future research is planned, including whether certain metadata elements best describe the resources from a particular discipline or domain and whether there are changes in preferred resources (from print to electronic) as GEM provides a more responsive Internet-based environment for meeting the instructional planning needs of educators.

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